FILE COPY
FOREST INSECT LABORA
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA.

FILE No. 662
Refer to: Noted by:

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH ADMINISTRATION
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

Project Date February 9, 1949 Author

TITLE

FOREST INSECT SURVEY OF THE JULIAN-CUYAMACA INSECT ZONE - SEASON OF 1948

By

E. T. Engen, Jr., Forester

Forest Insect Laboratory
29 Forestry Bldg., U. C.
Berkeley 4, California

U. S. GOVERNMENT PRINTING OFFICE 16—47272-1

SUBJECT—

INDEX NO.—

2-24-49

Distribution:

State Forester, Calif.
James K. Mace
E.A. Miller
Floyd Lewis
Forest Supervisor, Cleveland
Julian Chamber of Commerce
F.C. Craighead
E.A. Engen

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
WASHINGTON, D. C.

Forest Insect Laboratory
29 Forestry Bldg., U. C.
Berkeley 4, California

February 9, 1949

FOREST INSECT SURVEY OF THE JULIAN-CUYAMACA INSECT ZONE - SEASON OF 1948

by
H. T. Engen, Jr., Forester

Introduction

Evidence of an active engraver beetle infestation in the pine stands around the Julian-Cuyamaca recreational and summer home areas of San Diego County was noted by F. P. Keen, Senior Entomologist, Forest Insect Laboratory, Berkeley, California, in the fall of 1946 and called to the attention of the State Division of Forestry. By the summer and fall of 1947, aggressive killing, particularly in Coulter pine stands, with lesser damage to ponderosa and Jeffrey pine, had reached such proportions that immediate suppressive measures were necessary.

To combat the growing infestation, the State Board of Forestry set up a zone of infestation covering the Julian-Cuyamaca area October 16, 1947; and funds, which were matched by contributions from local owners and the County of San Diego, were provided for control work to be started in December 1947. The Berkeley Forest Insect Laboratory, Bureau of Entomology and Plant Quarantine, served in a technical capacity to advise on spotting and control methods.

Control work by the State Division of Forestry directed against the California five-spined engraver beetle and the western pine beetle was undertaken in the Julian-Cuyamaca Insect Zone during the winter and spring of 1947-1948--from December 1 to April 15. The control methods used were primarily fell and burn except during hazardous weather conditions, when a toxic penetrating oil spray was applied to the infested bark surfaces.

Detection surveys were made during the fall of 1948 to determine the success of the previous winter's control work and to provide a basis for judging the need of continued control work this winter. These surveys were made during October and early December by the writer, under assignment from the Berkeley Forest Insect Laboratory. The latter survey from November 28 to December 2 provided a more accurate basis for figures on currently infested trees than was possible in the October survey. The results of this survey are presented in this report.

Description of the Insect Zone

The Julian-Cuyamaca Insect Zone is located along the crest of the Cuyamaca Mountains in San Diego County in townships 13 and 14 south, and ranges 3 and 4 east, San Bernardino Meridian. The elevation of this area ranges from 4,000 to 6,500 feet. The terrain is characterized by gentle, rolling hills and valleys with occasional peaks rising abruptly from the surrounding country. To the east the mountains drop off sharply into the Anza Desert State Park, while to the west the country falls gradually toward the Pacific Ocean some 40 miles away.

The predominant timber type covering the Julian area is a pine-oak association consisting mainly of Coulter pine (Pinus coulteri), California black oak (Quercus kelloggii), California live oak (Quercus agrifolia), and canyon live oak (Quercus chrysolepsis). In the Cuyamaca area, the Coulter pine is largely replaced by Jeffrey pine (Pinus jeffreyi), while the oak species composition remains unchanged.

A small stand of ponderosa pine (Pinus ponderosa), is found in the Pine Hills unit, while sugar pine (Pinus lambertiana), white fir (Abies concolor), incense cedar (Libocedrus decurrens), and some big cone spruce (Pseudotsugae macrocarpa), grow on the northern slopes and moist valleys of the higher mountains.

The survey included a total of 22,700 acres which were covered with pine in association with other timber species; the surrounding acres were composed of agricultural, meadow, urban and brush - oak lands. Table 1 shows the breakdown of the land classes for the various entomological units in the Julian-Cuyamaca Insect Zone and adjoining lands.

Table 1 - Acreage of Pine Types on the Julian-Cuyamaca Insect Zone and Adjoining Land:

Unit	Pine-Oak	Coulter Pine	Ponderosa Pine	Jeffrey Pine	Jeffrey, Sugar Pine and Fir	Total Pine Acres
Julian	1,480	2,920				4,400
Pine Hills	40	950	110			1,100
Deer Lake Park	70	660	270			1,000
North Peak	1,290	1,530		980		3,800
Cuyamaca Park	960	2,220		5,220	1,700	10,100
Boulder Creek	170	1,990	140			2,300
Total	4,010	10,270	520	6,200	1,700	22,700

The attached map of the Julian-Cuyamaca Infestation Area contains the designated boundaries of the entomological land units and the timber types found in this region.

The survey consisted of a general reconnaissance of the area, utilizing high vantage points and a traverse of the road network to count the colored tops of the fading and faded trees. When conditions permitted, the ocular estimates obtained by the reconnaissance were verified by a more intensive survey which consisted of traversing the insect-killed tree groups on foot and counting and

blazing the trees individually. In the following table, which shows the acreage surveyed and the intensity of survey coverage for the individual units, it will be noted that there is a great deal of difference in the percent intensity of coverage for the various units. This can be attributed to two factors: (1) the disposition of the beetle-killed trees in the unit, i. e., units in which the killed trees occurred in groups, such as Cuyamaca and North Peak, would not show as many acres intensively surveyed as the units in which many killed trees were scattered throughout the unit; (2) the utilization of the land in the unit, i. e., intensively used land, such as the summer home and resort areas in the Julian and Pine Hills units were covered with a greater intensity than units in which the pine timber was not so directly involved in the land use.

Table 2 - Acreage Surveyed Intensively and by General Reconnaissance in the Julian-Cuyamaca Infestation Area:

Unit	Acreage of Pine Type	Acreage Intensively Surveyed	Acreage Covered by General Reconnaissance	% Intensity of Survey
Julian	4,400	3,970	430	90
Pine Hills	1,100	980	120	90
Deer Lake Park	1,000	200	800	20
North Peak	3,800	360	3,440	10
Cuyamaca Park	10,100	360	9,740	4
Boulder Creek	2,300	300	2,000	13
Total	22,700	6,170	16,530	27

Insects Involved

The California five-spined engraver beetle (Ips confusus Lec.), is the primary killer in this region, being responsible for over 90 percent of the mortality in the Coulter pine stands. Western pine beetle (Dendroctonus brevicomis Lec.), is found in approximately ten percent of the dying Coulter and ponderosa pine trees. The Jeffrey pines in the Cuyamaca area are attacked and killed by the Oregon engraver beetle (Ips oregoni Mich.). Less destructive, yet responsible for some mortality in the area, are the red turpentine beetle (Dendroctonus valens Lec.), and flatheaded borers (Melanophila Spp.).

Results of Survey

1. Character of the Infestation.

The survey of the Julian-Cuyamaca Insect Zone and adjoining lands indicated that there was no distinct pattern to the character of the infestation. Infested trees were found in large and small groups, on dry, exposed ridges, on moist, protected valleys and on northern and southern slopes with similar frequency throughout the area.

The character of the epidemic infestation could not be directly related to site or tree vigor factors, for loss occurred on all sites and among trees representing all classes of vigor.

2. Insect Losses.

Mortality resulting from the pine engraver beetle attacks in the pine stands of this area slowly began to appear towards the end of the month of June. Killing increased rapidly as the insect broods multiplied; and by December, when the last survey was made, over 2,500 trees had been attacked and killed as a result of beetle activity. This is an appreciable reduction in kill as compared with an estimated 6,000 trees destroyed in the same area during 1947 by the pine engraver beetle.

Comparison of the number of trees containing overwintering Ips broods in 1947 with those in 1948 shows an estimated 2,000 trees, of which approximately 1,000 were in the Julian - Pine Hills area and 1,000 in the rest of the insect zone, contained overwintering populations in 1947, while only 670 trees had overwintering beetles in 1948.

The following table contains a tabulation of the pine engraver beetle-killed trees noted from June to December in the Julian-Cuyamaca Infestation Area.

Table 3 - Current and Total Insect Losses in the Julian-Cuyamaca Infestation Area During 1948.

(Number of Trees)

Unit	Estimated Current Losses as of December, 1948	Estimated Total Loss from June to December, 1948
Julian	162	726
Pine Hills	59	153
Deer Lake Park	76	205
North Peak	37	171
Cuyamaca	49	169
Boulder Creek	287	1,142
Estimated Total	670	2,566

Further breakdown of the figures shown in the preceding table reveals the relative destructiveness of the succeeding Ips broods developed during the 1948 season. Comparison of the total trees killed per brood shows the overall trend of the infestation; this comparison would lead to the assumption that Brood #4 was the most destructive during the season, and at that point the infestation reached its peak. Broods #5 and #6 have been less destructive than Brood #4, and the present character of the infestation has become stabilized or is of a slightly decreasing nature. This is tabulated as follows:

Table 4 - Estimated Number of Trees Killed by Ips, Per Brood, in 1948.

Unit	Brood #1	#2	#3	#4	#5	#6
Julian	3	0	21	255	285	162
Pine Hills	3	0	0	152	39	59
Deer Lake Park	0	0	0	80	49	76
North Peak	0	46	0	58	30	37
Cuyamaca	3	19	10	44	44	49
Boulder Creek	0	0	220	340	295	287
Total	9	65	251	829	742	670

Table 4a - Seasonal History of Broods.

Brood	Initial Attacks	First Emergence	Abandoned
#1	Feb. 19, 1948	June 28, 1948	July 15, 1948
#2	June 16, 1948	July 30, 1948	Aug. 5, 1948
#3	July 15, 1948	Aug. 25, 1948	Aug. 30, 1948
#4	Aug. 12, 1948	Sept. 23, 1948	Sept. 30, 1948
#5*	Aug. 23, 1948	Oct. 5, 1948	Oct. 5, 1948
#6	Sept. 10, 1948	Overwintering in the standing trees	

* 30 percent of the trees containing Brood #5 were completely abandoned by December 2, 1948; the remaining 70 percent were only partially abandoned by that date. Apparently some of Brood #5 would overwinter in these trees.

Brood #6 constituted the major portion of the overwintering pine engraver beetle population, and the 670 trees infested with Brood #6 would necessarily have to be treated in an Ips control program. Trees containing Brood #5 would have to be considered in any control program also, for there would be partial broods in many of these trees.

The problem of separating Brood #6 trees from Brood #5 trees would not cause too much difficulty if a control program were to be started soon. Early in December the color difference between trees containing Brood #5 or #6 was striking enough to allow the observer to distinguish one from the other. The foliage of trees containing Brood #6 ranged in color from just-fading green to straw yellow, while the foliage of trees containing Brood #5 ranged in color from straw yellow to sorrel. With the passing of time, however, the foliage color of a tree will cease to be a good indicator for determining what brood it contains or had contained.

Trees containing overwintering broods of the western pine beetle make up less than ten percent of the total currently infested trees.

Conclusions

Two pertinent facts are evident from the forest insect survey conducted from October 6 to 13, and from November 28 to December 2, 1948.

1. Pine engraver beetles killed 2,566 trees during the 1948 season as compared to an estimated 6,000 trees killed during the 1947 season, an over-all reduction of 57 percent. Lands which were treated during the control work carried out during the winter of 1947-1948 show a greater reduction in subsequent killing. The Julian - Pine Hills area had approximately 1,000 trees to be treated in 1947 as compared with 221 trees to be treated in 1948, a reduction of 78 percent.

2. Data collected during the survey points to a change in the character of the current infestation from one of an increasing nature to one of a balanced or decreasing nature.

In view of these facts, it would seem highly desirable to continue the control work against the pine engraver beetle and the western pine beetle in this valuable resort area, to further reduce the beetle population and bring the infestation under control.

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT LABORATORY - BERKELEY, CALIFORNIA

FOREST INSECT SURVEY
JULIAN-CUYAMACA INFESTATION AREA

SAN DIEGO COUNTY, CALIFORNIA

SAN BERNARDINO MERIDIAN

SCALE

IN. 0 ½ 1 2 3 MILES

TIMBER TYPES

- PINE (Ponderosa, Jeffrey, Sugar, or Coulter)
- PINE — FIR
- PINE — OAK
- COULTER PINE
- NON-PINE & OPEN LAND

N

SANTA YSABEL CREEK
TOWNSEND RANCH
JULIAN
TO SANTA YSABEL
SAN DIEGO RIVER
COLEMAN CREEK
WYNOLA
78
79
WHISPERING PINES
TO BRAWLEY
KENTWOOD
DEER LAKE PARK
T. 12 S.
PINE HILLS
DEHR CREEK
HARRISON PARK
T. 13 S.
PINE HILLS GUARD STATION
CEDAR CREEK
BOULDER CREEK
AZALEA
NORTH PEAK
CUYAMACA RESERVOIR
MIDDLE PEAK
BOULDER CREEK
GUARD STATION
STONEWALL PEAK
CUYAMACA GUARD STATION
T. 14 S.
CONEJOS CREEK
CUYAMACA PEAK
TO LAGUNA
PARK H.Q.
EAST MESA
KINGS CREEK
SWEETWATER RIVER
DESCANSO
80
T. 15 S.
R. 3 E.
R. 4 E.
R. 5 E.